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University for Peace

University for Peace

Report of the Secretary-General

Summary

World events increasingly demonstrate that threats to peace, security and progress can only be restrained if there are men and women across the world who are motivated and qualified to prevent conflict, build peace, strive for justice and good governance and guide the processes of sustainable and equitable development. The mission of the University for Peace thus assumes increasing importance in the twenty-first century. The present report provides information on the development and implementation of the academic and professional training programmes of the University in various diverse, but mutually reinforcing fields related to peace and security. Apart from the academic teaching and training programmes at its headquarters in Costa Rica, which include eight master's degree programmes, the University has also expanded its activities into different regions of the world, developing networks of partner academic and research institutions, whose capacities are also being strengthened. The University has also developed a sharing knowledge for peace programme, using information technologies to enable its materials to reach those unable to participate in face-to-face teaching. Although donor support has increased over the years, full implementation of the University's programmes depends on enhanced and sustained support.

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I. Introduction

1. The University for Peace was established pursuant to an international agreement approved by the General Assembly in resolution 35/55. It was established with a clear determination to provide humanity with an international institution of higher education for peace with the aim of promoting among all human beings the spirit of understanding, tolerance and peaceful coexistence, to stimulate cooperation among peoples and to help lessen obstacles and threats to world peace, in keeping with the noble aspirations proclaimed in the Charter of the United Nations.

2. Significant efforts have been made in the past five years to revitalize and extend the activities of the University for Peace. The present report, which is submitted to facilitate consideration by the General Assembly of the item entitled "University for Peace" in response to General Assembly resolution 58/12, provides details of the progress made in revitalizing the University. It is commendable that significant progress has been made in the implementation of the five-year revitalization programme, leading to the achievement of the targets established by the Council of the University for Peace.

3. The present report has four major sections: (a) University for Peace in 2006; (b) external evaluation; (c) future development strategy; and (d) resource base. It describes the substantial progress made towards building high-quality programmes of education, training and research on critical issues of peace and security and, in parallel, to extend the programme into different regions of the world through its network of partner institutions. External evaluators have recognized the significant progress made by the institution since the start of the revitalization process and that it was rapidly gaining a very positive international profile. The future development strategy focuses on consolidating the progress already made in developing and conducting innovative academic and training programmes, and at the same time strengthening its collaborative arrangements in different regions of the world and the sharing knowledge for peace programme (including distance learning and dissemination of toolkits for teaching).

4. The University for Peace is making efforts to strengthen cooperation with other institutions in the United Nations system, such as the United Nations University and the United Nations Institute for Training and Research (UNITAR). Efforts are also being made to develop collaboration between the University for Peace and the system with regard to support in peacebuilding and peacekeeping efforts.

5. The General Assembly, in its resolution 58/12 (2003), noted with appreciation the vigorous actions taken by the Secretary-General to revitalize the University for Peace. The General Assembly invited Member States, intergovernmental bodies, non-governmental organizations and interested individuals to provide financial support to the University, invited Member States to accede to the International Agreement for the Establishment of the University for Peace and requested the Secretary-General to consider further ways to strengthen cooperation between the United Nations and the University for Peace.

II. University for Peace in 2006

6. The University for Peace has made substantial progress towards building high-quality programmes on critical subjects related to peace and security and extending them to different regions of the world through networks of partner institutions. With the efforts to revitalize and strengthen the University, it is now, more than ever, a recognized and respected international institution for education, training and research on all issues related to peace and conflict. Its efforts are focused on strengthening the three main components of its activities: face-to-face teaching and research; increasing impact: expanding the presence of the University for Peace in the world; and increasing impact: sharing knowledge for peace programme.

A. Face-to-face teaching and research

7. The University has launched a rigorous new academic programme comprised of activities in diverse and mutually reinforcing areas related to peace and security. The University for Peace offers master's degree programmes at its Costa Rica campus in the following areas: (a) international peace studies; (b) international law and human rights; (c) international law and settlement of disputes; (d) gender and peacebuilding; (e) peace education; (f) natural resources and sustainable development (offered as a dual-degree programme in partnership with the American University, Washington, D.C.); (g) environmental security and peace; and (h) media, conflict and peace studies. Since 2002, a total of 262 students from 69 countries have graduated. Out of the graduated students, 58.39 per cent are women, and the average age of students is 27 years. More than 130 students from 37 countries are enrolled in the master's degree programmes for the academic year 2006-2007.

8. In order to ensure the intrinsically interdisciplinary nature of academic offerings, all students engage in an initial foundation course in international peace studies and participate in an elective course programme by enrolling in courses offered by other master's degree programmes. Since January 2006, the University has offered this elective course programme as a "University for Peace Institute", inviting professionals, practitioners, academicians and students of peace and conflict, along with students of the University for Peace, to participate in interactive participatory classes and informal gatherings which bring together several cultures and views.

9. The unique, multicultural character of the headquarters campus is viewed as a laboratory for developing and perfecting all of the University's offerings, which are then used not only by the students enrolled in the master's degree programmes in Costa Rica but also by institutional partners around the world in the form of cutting-edge academic graduate studies, short courses and distance learning tools. The curriculum developed is constantly updated by regional expertise and experience on the basis of inputs received from partner institutions in Africa, Asia, Latin America, Europe and elsewhere. The University's short courses and training on peace and conflict related issues have been organized with various institutions, organizations and partners worldwide. Some 60 of those courses have been held in all regions in the last four to five years in which nearly 2,000 individuals, selected by partner institutions, have participated.

10. A research and publication programme has also been established by the University, with a comprehensive research policy that provides the framework for nurturing a vibrant, dynamic and intellectually stimulating environment for the generation and dissemination of knowledge. In 2006, the University for Peace launched its online reference journal, *Peace and Conflict Review*.

B. Increasing impact: expanding the presence of the University for Peace in the world

11. In order to increase the impact of the University's work and achieve a multiplier effect, partnerships have been established with academic and research institutions in different regions of the world, which have resulted in the initiation of University activities in Africa, Asia and the Pacific, Central Asia, Latin America and the Caribbean, Europe, the Middle East and North America. Discussions are under way to extend the University's presence in other parts of the world. The driving force behind this strategy is the realization that the work carried out in Costa Rica, while important, would only be able in itself to make a small impact and that the regional presence adds an important multiplier effect to the efforts of the University.

Africa programme

12. In 2002, the Africa programme was launched and the University for Peace began a far-reaching consultative process across the continent to identify the needs, aspirations and obstacles to developing capacity for education for peace in Africa as well as to identify partner institutions. The planning process led to the design of a five-year programme of support to an initial set of African universities to build their capacities to teach and research the vital issues of conflict prevention, peacebuilding, environmental security, reconciliation and human rights. The programme has conducted several activities in the region, including the development of Africa-specific teaching materials on a variety of topics, such as human rights, peace and justice, gender and peacebuilding, and introduction to peace and conflict studies in West Africa. As a result of the latter, more than 54 universities in Nigeria will be integrating a course on peace and conflict resolution studies into all their undergraduate programmes. A total of 120 university libraries have been presented with teaching materials and resources. The programme has also conducted 12 capacity-building workshops and training courses for regional organizations, university faculty representatives and NGO networks.

13. The programme continues to formalize partnership arrangements with African institutions such as the African Union, with which the University for Peace organized in June 2006 an international conference on the theme "Strategies for peace with development: the role of education, training and research". The programme is also extending into countries other than the 10 visited during the consultative phase. To reflect true African leadership, the programme has moved its offices to Addis Ababa and is hosted by Addis Ababa University, from where the Director, along with a soon-to-be established Advisory Committee, guides the programme's continual development and direction. A headquarters agreement was signed with the Government of Ethiopia in September 2005.

Asia and the Pacific programme

14. The overall aim of the Asia and Pacific programme is to strengthen the capabilities of the interested academic and research institutions for education, training and research for the building of peace, the prevention of violence and deadly conflict and the promotion of human security in the region. During the past four years, the University for Peace has mobilized a network of universities and institutions for conflict prevention and peacebuilding in Asia and the Pacific with 40 members from more than 20 countries. The University has developed an action programme aimed at strengthening education for peace in the region. The main objective of the programme is to strengthen the capacities of interested and committed institutions to undertake high-quality teaching, training and research in the crucial areas related to peace and conflict. Emphasis is also being placed on identifying and expanding the effectiveness of alternative and non-formal channels through which education for peace may reach the general populace, especially through civil society, women's and youth groups, members of defence and police services, religious institutions and the like.

15. Some of the activities that are already being conducted include the teaching of a joint diploma course in Sri Lanka in Skills Development for Conflict Resolution. This course, which is offered twice a year, is targeted at practitioners, including civil servants, military and police personnel and NGOs. A subregional curriculum development workshop was held in India (attended by participants from India, Bangladesh and Sri Lanka) for a foundation course in peace and conflict and studies, following which a number of institutions have started courses in the subject or incorporated peace studies as part of their ongoing degree programmes in international studies. With the support of and under the umbrella of the University's Toronto Centre, a curriculum development workshop on peace education in an Islamic context was conducted in Toronto, Canada (in which other institutions from North America also participated). The curriculum developed will be introduced into their programmes by institutions from the participating countries (Bangladesh, India, Indonesia, Pakistan and Tajikistan). Efforts are also being made to develop programmes in the areas of religion; inter-faith cooperation and peacebuilding; gender and peacebuilding; development, peace and security; media, peace and security; and others.

16. With funding from the Nippon Foundation, the University for Peace will begin to offer a dual campus master's programme in international peace studies at the Ateneo de Manila University in the Philippines and at its headquarters campus in Costa Rica.

Central Asia programme

17. The main aim of the Central Asia programme is to transfer and build self-sustaining capabilities for peace education and civil society training, research and dialogue. Many Central Asian academics, teachers and experts who have been exposed to master's degree courses on peacebuilding and conflict prevention now teach such courses in their own countries. The programme actively collaborates with United Nations partners in providing training and promoting dialogue. Among such activities were a high-level conference on the theme "Lessons of the Tajik peace process for Afghanistan", a series of training-for-trainer seminars in Tajikistan for about 90 diverse local and national civic leaders and officials from opposite parties

in the 1992-97 Tajik civil war, and a seminar on pre-electoral conflict prevention for high-level officials in Kyrgyzstan. Recently, the programme focused its efforts on the urgent needs of societies in Central Asia to constructively involve its Islamic majority population in preventing, resolving and transforming conflict. A special emphasis was put on Islam's own values and principles of peacemaking and peacebuilding. As the next step, the Central Asia programme organizes specialized training seminars for various target groups, including Islamic communities, madrassa students, media representatives and other crucial actors, such as government officials. Teaching and training courses on conflict prevention and peacebuilding, developed together with Central Asians, integrate local knowledge and expertise. Such courses proved to be effective instruments for developing and disseminating educational and teaching methodologies to promote education for peace and to build human capacities through fostering a culture of peace at all levels of education in Central Asia.

Latin America and the Caribbean programme

18. The Latin America and the Caribbean regional programme is based at the University's headquarters campus in Costa Rica and has the following educational objectives:

(a) Introducing the study of realities in Latin America and the Caribbean in terms of development, peace, security and democracy into the University's academic programmes;

(b) Organizing academic programmes about the Latin America and the Caribbean reality for the region's audiences;

(c) Building partnerships with other institutions in the region and jointly organizing higher education activities for international and regional audiences to discuss peacebuilding processes and the nature of conflicts in the region.

19. During the twelve-month period ending in August 2006, the University for Peace Latin America and the Caribbean programme has carried out the following activities:

- Joint sponsorship, with the Brazilian Federal Government, of the International Seminar on Education for Peace, in Brasilia in December 2005;
- Presentation of the theme "Reconstruction and human security" in the international workshop on human security organized by the Government of Mexico in cooperation with the Government of Japan, in Mexico City in February 2006;
- Presentation of the theme "Non-Central American actors in the peace initiatives of the 1980s and beyond" in the international conference on the theme "Lessons learned in the Central American regional peacebuilding process", in Toledo Spain, from 2-4 March 2006;
- Organization of a workshop on strategic planning for the development of the Open University of the Environment and the Culture of Peace for the municipal Government of São Paulo, Brazil, in April 2006;
- Developing proposals for the United Nations Democracy Fund and the Latin American and the Caribbean Bureau of the United Nations Development

Programme (UNDP), for co-sponsoring academic and advanced training activities for Latin American and Caribbean audiences on contemporary issues related to the consolidation of democracy, good governance, human development and human security;

- Working with the Spanish Agency of International Cooperation in order to sign an agreement of collaboration to support academic and training activities on peacebuilding and conflict prevention in the region;
- Developing a three-week course at the post-graduate level on Contemporary Issues of Development and Democracy in Latin America to be offered to University for Peace students in the academic year 2006-2007.

Toronto Centre

20. With support from the Government of Canada, through the Toronto Waterfront Revitalization Corporation, a secretariat was established in Toronto in July 2005 to undertake the preparatory work to establish an international centre of the University in Canada. The scope of the programme for the Centre has now been finalized, and a range of pilot activities have been implemented including formal and non-formal curriculum development workshops, panel discussions, public forums and exhibitions. In October 2006, an international high-level expert forum on capacity-building for peace and development: roles of diaspora will be convened. The Centre aims to leverage North American experience and expertise to enrich the worldwide education, training and research programmes of the University and its partners; reinforce and amplify the capacity of North American institutions engaged in formal, informal or non-formal education for peace; develop high-quality programmes of education and training on strategic themes related to building peace, lessening violence and managing conflict; and expand the opportunities and channels available for the Canadian public to participate in formal and non-formal education for peace. The following strategic themes have been identified: peace education; diaspora and peacebuilding; urban violence; media, peace and security; and creative arts and peacebuilding. Support for the establishment of a University for Peace presence in Canada has been voiced by leaders from the political, business, philanthropic, academic and NGO sectors. A number of partnerships are in negotiation to collaborate on curriculum development, teaching, research, public lectures and the preparation of multimedia learning materials. Building on the initial funding provided by Canada, the University for Peace is now seeking long-term financing to ensure the sustainability of the Centre's activities.

Institute for Media, Peace and Security

21. In addition to its regional activities, the University for Peace established the Institute for Media, Peace and Security with the aim of educating people in the many ways that media interact with peace and influence conflict and security. The Institute has conducted teaching seminars in Africa (Rwanda) and Geneva, and will soon be teaching in Toronto. Its principal accomplishment has been the development of a full-fledged master's degree programme in media, conflict and peace studies with eight new specialized courses, including media and ethno-cultural war; media and terrorism; the Israeli and Palestinian media and the intifada; media ethics in time of war; media dilemmas of United Nations peacekeeping operations; and the media in the Rwanda genocide, in addition to the introductory course on media,

conflict prevention and peacebuilding. To teach those courses, the University for Peace will use a roster of distinguished professors from several countries and permanent staff of the University in Costa Rica. The first master's degree programme anywhere dedicated to media and peace will start at the University's headquarters campus in September 2006.

Other centres and activities

22. The University for Peace has two offices charged especially with linking it to the various bodies of the United Nations and the community of NGOs that work with the United Nations system. The University for Peace office in Geneva, in existence since 2000, was initially set up to be a liaison office with the United Nations and other institutions and to foster cooperation and programme development in areas most accessible from that location. That office has also served the very useful purpose of nurturing the Africa programme (before its move to Addis Ababa), the Central Asia programme and the Institute for Media, Peace and Security. Future plans for the office include offering short courses drawn from the University for Peace curriculum to NGOs and United Nations organizations; organizing a University for Peace lecture series; and participating in the preparation, distribution and monitoring of the toolkits for teaching materials described in the section below.

23. The University for Peace office in New York, opened in 2001 and has served a key liaison function with New York-based United Nations bodies, foundations, NGOs and other institutions in the United States of America, and serves as the temporary base for the Asia and the Pacific programme.

24. The University for Peace has collaborated with institutions in Jordan and Egypt and has plans to expand its activities in the Middle East.

25. In support of the Secretary-General's initiative to foster a peaceful resolution of the security, humanitarian and development problems of the Korean peninsula, the University for Peace established a special trust fund to mobilize financing for that purpose.

C. Increasing impact: sharing knowledge for peace programme

26. The University for Peace sharing knowledge for peace programme is an integrated programme aimed at sharing and disseminating knowledge to strengthen education for peace. The overarching goal of the programme is to share teaching materials (referred to as toolkits for teaching) with educational institutions in developing countries and countries in transition in a form that can be readily used in difficult and restricted conditions. In the pilot phase, three toolkits for teaching were developed in Costa Rica. The toolkits are on peace and non-violent transformation of conflict; gender analysis of the environment and sustainable development; and enfoque de genero en los procesos de paz, produced in Spanish. The Africa programme has also contributed to this part of the University's activities by preparing more than a dozen DVDs based on African training courses with the aim of contributing African resources to the academic programmes taught in Costa Rica and to share this material with partners in the region.

27. By disseminating multicultural knowledge to young leaders and teachers using technologies such as DVDs, CDs and the Internet, a more effective use of resources

and a substantial multiplier effect can be achieved. The toolkits for teaching are based on the curricula developed at the University for Peace Costa Rica campus and therefore reflect the best international expertise, but at the same time can be adapted to respect specific local contexts.

28. The University for Peace headquarters campus has a well-equipped media laboratory and trained technicians, and most courses delivered to students are also recorded. Interviews with visiting faculty are taped so as to ensure that none of the teaching remains only in Costa Rica but is shared with the entire University for Peace system and with partner institutions around the world.

III. External evaluation

29. External evaluators on three separate occasions have recognized and appreciated the significant progress made by the University for Peace since the revitalization process was initiated. An independent assessment carried out in May 2004 by a team contracted by the Canadian International Development Agency confirms that under difficult and uncertain conditions, the University has achieved substantial progress and is now functioning as an effective and efficient teaching institution with proper financial management and is up to international standards. Additional evaluations were conducted by the Deutsche Gesellschaft für Technische Zusammenarbeit and an independent team which, at the request of the Foreign Ministry of Finland, evaluated the MA Programme in gender and peacebuilding.

30. The following two quotations provide the essence of the Canadian International Development Agency's institutional assessment of the University for Peace:

> "Within three years, it was able to re-establish itself administratively, financially and academically to such an extent that it is rapidly gaining a very positive international profile. This is no mean feat considering that it was given a very challenging triple mandate: to establish an international institution of higher learning in Costa Rica by engaging in teaching, research and training in support of peacebuilding; to motivate and facilitate the establishment of such programmes in the major regions of the world; and to disseminate teaching materials using information technology together with a distance education curriculum.
>
> "The University has entered the fourth year of a five-year revitalization period. To say it has 'turned the corner' barely does justice to its achievements. Although there are still wrinkles to be ironed out and steps to be taken, the assessment team feels that the University is well on its way to fulfilling its renewal pledge."

IV. Future development strategy (2006-2008)

A. Long-term vision

31. The University for Peace has rapidly evolved to a vibrant international organization that has established sound administrative, financial and audit systems to international standards. It has developed an innovative academic programme and extended its programme activities worldwide. The vision for an even more vigorous

and effective institution in the long term includes the consolidation and reinforcement of the capacities of the headquarters campus serving the entire University for Peace system, with curriculum development, face-to-face teaching and research and sustained two-way links to considerable experience and knowledge found in institutional partners in other parts of the world. The strengthening of the University's influence and presence in institutions in several regions, and an active programme of sharing knowledge for peace (including distance learning and dissemination of toolkits for teaching) will also be expanded in terms of content and reach.

32. In the spirit of General Assembly resolution 58/12 (paras. 2 and 3), attempts are also being made to develop collaboration between the University for Peace and the United Nations system, particularly for support in peacemaking, peacekeeping and peacebuilding efforts. For example, as a pilot project this year, the Department of Political Affairs of the United Nations Secretariat, through its peacemaking databank project (www.un.org/peacemaker), will be working with three graduates of the University for Peace to conduct research on critical areas related to peacemaking and peace agreements. The studies are expected to be completed at the end of 2006.

33. The University for Peace attaches special importance to its relationships with other United Nations education and training organizations, particularly UNESCO, the United Nations University and the United Nations Institute for Training and Research. It intends to strengthen its cooperation and coordination with them in the context of a more cohesive and effective United Nations University system.

B. Three-year targets

Objective 1: strengthening face-to-face teaching and research

34. Building upon the success in delivering face-to-face education over the past five years, the University for Peace will aim at achieving the following:

(a) Increase the master's degree programme offerings at the headquarters campus by adding the eighth master's degree programme in media, conflict and peace studies for the academic year 2006-2007;

(b) Increase the number of master's degree students at the headquarters campus to a maximum of 200 from a wide variety of countries and backgrounds. Approximately one half of them will be on full or partial scholarship to ensure that students from less privileged backgrounds, in particular from developing countries, are able to gain from the University's offerings;

(c) Increase the number of research projects undertaken by faculty with results published in internationally recognized journals.

Objective 2: extending the University for Peace presence in the world

35. The University for Peace programmes will be consolidated and strongly anchored in various parts of the world through partnership arrangements with a number of institutions, with the following main objectives:

(a) Develop partnership arrangements with universities and institutions from each continent for student and faculty exchanges and possible joint master's degree programmes;

(b) Conduct every year in each University for Peace location curriculum development workshops and/or training-of-trainer short courses to prepare academicians and practitioners for teaching and training in the area of peace and conflict studies;

(c) Encourage University for Peace alumni to return to their home institutions, or to other locations in the field, to establish programmes in cooperation with the University and its partners;

(d) Conduct action research case studies to address relevant peace and conflict-related issues in collaboration with regional partners.

Objective 3: sharing knowledge for peace programme

36. The sharing knowledge for peace programme is now ready to reach a new stage by expanding the production and distribution of the toolkits for teaching; offering a distance learning master's degree in peace and conflict studies, as well as a University for Peace book series publications programme, and a conference or lecture series, all aimed at reaching beyond the confines of the headquarters campus and the regional programme offerings.

37. As a result of activities launched in Africa, the University for Peace is currently producing a new toolkit for teaching. Materials produced in Spanish are also being tested in Latin America.

38. The University is moving ahead to gain experience in the field of distance e-learning. More specifically, the University plans to offer a master's degree programme in peace and conflict studies through Internet-based distance education, which will enable large numbers of graduate students and professionals working in that field to gain qualifications and upgrade their knowledge and skills.

V. Resource base

39. The University for Peace needs to raise funds to support its operations. It seeks funding from Governments, NGOs, philanthropic foundations, the corporate sector and individuals. As a result of the demonstrable progress made in the development and implementation of its programme, the University is now able to strengthen its relationships with current and potential donors. It has received support from a number of donor Governments, foundations and institutions, including: Canada (through the Canadian International Development Agency, the International Development Research Centre and the Toronto Water Revitalization Corporation), Denmark, Finland, Germany, Italy, the Netherlands, the Dutch National Postcode Lottery, Norway, Sweden, Switzerland, the United States of America, UNDP, the Philanthropic Collaborative and Chairman Kim of the Hanwha Group, Republic of Korea. At the beginning of the revitalization process (1999), the University for Peace received support mainly from the United Nations Foundation, the Canadian International Development Agency and the Rockefeller family, who provided the initial funds at a crucial and difficult moment in the history of the institution. The University receives no regular financial support from the United Nations.

40. The Netherlands funded the pilot year (2002) of the Africa programme, which has successfully engaged African scholars and experts in the formulation of a

longer-term programme to build capacities in Africa for teaching peace and conflict studies. The five-year programme, developed with support from the Netherlands and Denmark, has been launched with additional support from Canada, Norway, Sweden and Switzerland.

41. The Government of Finland supported the master's degree programme in gender and peacebuilding, and Germany provided support for course development in the fields of international peace studies and peace education. The International Development Research Centre in Canada has provided consistent support to the natural resources programme of the University. While Denmark, Norway, Sweden and the United States of America have supported the regional programme on education for conflict resolution in Central Asia, Canada and the Canadian International Development Agency financed the formulation process for the Asia and the Pacific programme. The Government of Canada is also making a strategically important contribution, as part of the Toronto Water Revitalization Corporation, as a result of which the University has been able to set up a centre in Toronto to conduct teaching and research in the areas of peace and security.

42. The University has established a scholarship fund that enables qualified students from developing and transitional countries to obtain high-quality education in the field of peace and conflict studies. The fund was initiated in the 2002-2003 academic year through a generous multi-year grant from Professor Steven Rockefeller. Scholarships have also been funded in succeeding years by Germany for the programmes in peace studies, by Canada for African students and by Finland for the gender and peacebuilding programme and by the Toronto Water Revitalization Corporation. Maintaining and expanding the scholarship fund will be crucial in terms of allowing students from mainly developing countries to continue to have access to the programmes of the University.

43. The University for Peace is in the process of diversifying the donor base to include more countries, foundations and individuals. The fund-raising strategy for the future will rely on the existing donors, having funded the University when it had hardly any programmes, to continue to contribute support for the overall University for Peace framework. If this is achieved, the University management will turn its attention to obtaining a financial basis to run the University in the future, with a hoped-for endowment fund which would generate revenue for operational costs. Funds for special projects, scholarships and physical facilities would then be raised on a case-by-case basis, matching donor interests with the University's activities. It is encouraging to note that an Alliance for the University for Peace has been set up in the Netherlands and that a group of supporters has set up the United States Association for the University for Peace with tax-exempt status in the United States. Both of those bodies are helping in fund-raising activities.

44. It should be mentioned here that from a level of about $750,000 in 1999 and an inherited deficit, the University budget grew to approximately $7 million in 2005. This is owing to the support provided by donors who recognize the tremendous achievements of the institution in the process of revitalization and expansion of its programmes. However, if the institution is to consolidate its programme and fulfil its potential, it would need resources of a much higher level. For the academic year 2006-2007, the resource requirement is of a level of approximately $9 million.

VI. Conclusion

45. The University for Peace has demonstrated the capacity to fulfil its mandate by providing capacity-building to large numbers of young people, civil leaders and professionals to gain the knowledge and skills that are urgently needed for the prevention, management and resolution of conflict. By the end of 2006, the University will have achieved the targets established by its Council for its five-year revitalization programme. The University now has a strong international academic and administrative staff at its Costa Rica campus, as well as at its various locations in other parts of the world. It has an excellent international student body and alumni, all working towards the goal of peace and security in various international or national bodies. The University for Peace community will continue to grow and to be strengthened.

46. Building on those achievements, and based on the well-established academic programme and network of partners, the University has entered a new phase of consolidation and prudent expansion. It is therefore essential that a larger number of Governments show support by acceding to the International Agreement for the Establishment of the University for Peace and helping to further strengthen the financial base of the institution. This will enable the University to sustain the momentum generated in the last four years so that it can continue to perform its role as a worldwide institution devoted to the education and training of men and women who, within the framework of the Charter of the United Nations, will contribute to peace, progress and the well-being of humanity. Increased and sustained support is needed to implement the next phase of the University for Peace programme, for which the renewal of support by the Government of Costa Rica as host country to the University is particularly important, indeed indispensable.

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Globalization and interdependence: globalization and interdependence

Role of innovation, science and technology in pursuing development in the context of globalization

Report of the Secretary-General

Summary

The important role of science, technology and innovation in enhancing economic well-being is widely recognized. The General Assembly in its resolution 60/204 of 22 December 2005 emphasized this crucial role. The 2005 World Summit Outcome adopted by the Assembly in its resolution 60/1 of 16 September 2005 also stressed the crucial role of science and technology in accomplishing the internationally agreed development goals. The second phase of the World Summit on the Information Society, held in Tunis in November 2005, highlighted the need to establish an inclusive and development-oriented information society, where everyone could create, access, utilize and share information and knowledge.

Accordingly, the present report highlights the multidimensional and key developmental role of science, technology and innovation. It also emphasizes that scientific and technological capacity requires sound institutional-building as well as the nurturing of a complex network of partnerships among a wide variety of stakeholders spread across the globe. The report also makes recommendations for action at the national and international levels.

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I. Introduction

1. Innovation drawn from scientific research and new technologies is a major driving force of long-term economic growth and social well-being. In an era of increasing competition in a globalizing economy, the key to enhancing national competitiveness and sustained economic growth lies in the rapid development and exploitation of new products, processes, services and systems, and the constant upgrading of existing technologies. Bearing in mind this crucial role of science, technology and innovation, the General Assembly in its resolution 60/204 of 22 December 2005 emphasized the importance of science and technology. It stressed the importance of information and communication technologies (ICT) for development, calling for a people-centred and inclusive information society so as to enhance digital opportunities in order to help bridge the digital divide. The 2005 World Summit Outcome[1] also stressed the crucial role of science and technology in accomplishing the development goals. The second phase of the World Summit on the Information Society, held in Tunis in November 2005, highlighted the need to establish an inclusive and development-oriented information society, where everyone could create, access, utilize and share information and knowledge.

2. Today, developing countries diverge greatly in terms of their abilities to access, diffuse and use scientific and technological knowledge, most of which is generated in developed countries and protected by intellectual property rights; they also have varying capacities to translate scientific and technological knowledge into goods and services and invest in human resources and entrepreneurial capacity-building. Similarly, they diverge in terms of their appreciation of the importance of science and technology for development. This "international technology gap" is one of the main causes of the rapidly expanding socio-economic gap between rich and poor nations and constitutes a major challenge for developing countries in their efforts to achieve the development goals. This gap is evident not only along the traditional North-South divide, but also among developing countries and economies in transition.

3. The presence of a "domestic technology gap" is also evident within many developing countries; that is to say, high-tech modern production units coexist with backward ones, hence large-scale corporations coexist with small urban firms, and large agro-business exists side by side with subsistence agriculture. Such differences in the ability to access, adapt and imitate technology affect overall production processes, thereby leading to inefficiencies. The domestic technology gap contributes to higher levels of inequality. Interventions bridging this gap require careful phasing and policy considerations that take into account the growth and the equity dimensions, with the objective of transforming the lives of the poor and underprivileged.

4. The present report addresses some of the most pressing concerns of developing countries and offers recommendations building on the premise that policies on science, technology and innovation have ultimately to be devised by countries according to their own unique needs, their priorities and their stages of development.

[1] See General Assembly resolution 60/1.

II. Building scientific societies at the national level

5. At the national level, developing countries need to actively pursue policies that strengthen their innovation systems. Some areas where intervention would reap rich dividends are highlighted below.

A. Education

6. Investing in science and technology education is necessary for developing countries with respect to not only the generation of new technologies but also the acquisition of the capacities to imitate and adapt to local conditions science and technology developed elsewhere. Unfortunately, many developing countries are plagued by a large number of constraints: low levels of school enrolment; lack of a coherent policy framework that addresses scientific education; and lack of resources that can be devoted to scientific teaching. As a result, the quality of science education is low and the resources allocated to science in schools are generally few. The government has a key role to play in this regard, by encouraging the adoption of curricula that ensure that all students completing secondary school in any field will have been exposed to at least some scientific knowledge. Scientific and technological education should start at the primary level and be consolidated through the secondary level.

7. Changes are also required at the high school level. Curricula at the high school level should be updated to prepare students for further education in the area of science. Policies supporting scientific education should be developed bearing in mind the constantly evolving nature of technical and scientific learning. In this regard, the ongoing training of teachers and an improvement of the content and quality of education at all levels are critical. Also, sound technological, scientific and engineering education in relevant fields at an advanced level is crucial, as such education provides the basis for building a strong body of scientific talent. Increasing enrolment in courses on technical subjects at the tertiary level, by making them more attractive and allocating more resources to them, is essential. Rates of enrolment at the tertiary technical level differ among regions, with sub-Saharan Africa having the lowest rates of enrolment.

8. With trade and investment in the global economy having expanded since the 1980s, there has been an increase in the international trade in education services, particularly in higher education. The number of students enrolled in tertiary education in advanced countries has been growing rapidly. In developed countries, the number of foreign students enrolled in tertiary education increased from 864,000 in 1990 to 2 million in 2003. There is also a growing "mobility" of the service providers themselves, which, often with government support or encouragement, have been expanding partnerships with foreign educational institutions or even setting up branches of their own institutions abroad. In order to enhance domestic capacity to provide education at the higher levels and to reduce the foreign-exchange costs associated with study abroad, some developing countries are allowing, prestigious foreign universities to set up "branch campuses" in their territories, if not actively seeking out such institutions. Well-known institutions from developing countries are also actively setting up branches in other developing countries in the context of South-South cooperation, especially in management studies, engineering and information technology. For their part, developed countries

are interested in fostering such collaboration partly because the export of educational services can be an important source of income. Such a "globalization of education" has meant more partnerships, increased networks and increased mobility of skilled individuals. These changes are occurring because Governments, universities and corporations recognize that there is a global shortage of highly trained workers and are taking steps to expand their numbers.

9. Developing countries' limitations restrict the conduct of cutting-edge scientific and technological research. Thus, much attention has been devoted to the process of transfer of technology from developed countries, which is never passive. Indeed, this is an active process of learning and adaptation, which represents a challenge for most developing countries. There is also the need to match innovations with basic local needs. Universities have an important role to play in all these processes. They can get involved with their communities, thereby gaining direct knowledge about social needs, some of which could be addressed through research and development (R&D) activities. Universities can also be encouraged through a mix of appropriate policies and institutions and adequate funding (public and private) to generate local technologies as well as adapt innovations produced abroad to local needs, and can be active participants as well in the operation of technology parks and similar entrepreneurial activities. Vocational training is also crucial. One determinant of an effective relationship between the university and industry is the degree of responsiveness of educational curricula and activities to the emergence of new areas of industrial technology or of specialized sectors. Both R&D and vocational training often entail establishing effective networks among institutions of higher education, technical and vocational training, research units, technical associations and industry.

10. Women continue to be underrepresented in science and engineering courses; and the fact that women are, as a result, underrepresented in the professions of science and technology limits their full participation in the labour market. Concrete measures to increase the enrolment of girls and women in scientific and engineering disciplines should thus be taken. Such measures should seek to make these fields more attractive to women, remove the gender barriers to science and engineering education and training, promote equal training opportunities in science and technology-related fields, and strengthen gender-sensitive curricula in formal and non-formal education for all.

B. Building capacities in agriculture

11. Three quarters of the world's poor live in rural areas and are mainly engaged in agricultural activity in developing countries. It is therefore imperative that agricultural research and technological innovations be fostered so as to enable the rural poor to overcome poverty and participate in the global economy. Technological progress has enabled both increasing supplies of food to come from roughly the same cropland base and the real cost of food to decline over time. Technological advances in agriculture have taken the form of new varieties of crops and chemical inputs, as well as innovations in agricultural machinery and farm practices. More recently, R&D in agriculture has helped produce genetically modified crops. Agricultural R&D thus has the potential to help developing countries meet their nutritional goals. Genetic engineering, however, has given rise to environmental, food safety and broader development concerns, which should be fully addressed during the R&D process.

12. In advancing agricultural research, the role of the State is crucial. The success of the green revolution in Asia depended not just on the development of new hybrid "high-yield" seeds, but also on the infrastructure and support services developed by the State to produce the seeds and to deliver the attendant fertilizers, pesticides and irrigation. The region that is now most in need of an agricultural revolution is Africa, where net agricultural production per head is less than it was in the 1960s when the green revolution started to lift productivity in Asia. In this regard, there is an important role for the public sector to assume in ensuring that research is undertaken that may seem not to be profitable privately. In particular, agricultural needs in poor tropical countries differ significantly from those in temperate rich countries; yet, limited agricultural research is performed on products significant for the tropics and in tropical ecosystems. It has been suggested that such research concentrate on so-called orphan commodities — for example, low-value crops, such as cassava and sweet potatoes, that are important as staples for poor people in large parts of the developing world.

13. Agricultural R&D cannot be left entirely in the hands of the private sector. In developed countries, the public sector undertakes about half of agricultural R&D and in developing countries the proportion is much larger. To encourage private R&D in tropical agriculture, traditional funding of research may be usefully supplemented by a commitment to reward developers of specific new agricultural technologies with appropriate tax credits for R&D. Another possibility is to put in place a purchase-guarantee mechanism, whereby those who develop the new seeds would be assured of a reasonable income from sales. There is also a need for global agricultural research institutes that can focus on the needs of the poorest. Through its work, the Consultative Group on International Agricultural Research (CGIAR) has brought the benefits of modern science to poor farmers all over the world. The activities of the Consultative Group as well as South-South cooperation in this field should be strongly supported by the international community.

14. Another area that needs attention is that of exports of agricultural products. Developing countries account for approximately 30 per cent of world trade in agricultural products (US$ 783 billion in 2004). The ability to compete in the area of agricultural and food products is increasingly dependent on meeting safety, quality and environmental requirements (above and beyond price and basic conditions). The last decade has witnessed greater scrutiny of production and processing techniques as well as stricter traceability and labelling requirements across the food supply chain. While most sanitary and phytosanitary measures, such as those related to human health and safety, are embodied in technical regulations, there is also a discernible upward trend in the development of private standards, as retailers in developed economies impose stringent conditions.

15. While many in the developing countries perceive the increasing requirements as a potential and significant barrier to trade, the ability to raise capabilities in this field also presents a major opportunity for upgrading and catching up with other high-value food-exporting countries. Developing countries need to enhance the ability of private firms to comply with these requirements as well as strengthen the institutional infrastructure that helps demonstrate compliance. Since the requirements of a well-functioning system of sanitary and phytosanitary measures are relatively complex, it would not be realistic to expect that all the actors in developing economies (and especially in the least developed ones) can make significant progress in this area in a short period of time.

16. At first, developing countries need to enhance policymaking capabilities, including the updating of legislation to enable food safety control agencies to respond to current challenges. Technological capacities of food standards and quality control agencies need to be enhanced. Public-private cooperation for the effective functioning of the food safety system needs to be encouraged. However, this should be achieved by adapting necessary technologies to local conditions, as far as possible with the help of indigenous capabilities.

17. Another issue that arises through the progress of agricultural R&D is the protection of intellectual property rights, which are central to the private sector's motivation to engage in R&D. The World Trade Organization Agreement on Trade-related Aspects of Intellectual Property Rights[2] came into force on 1 January 1995 and the developing countries agreed to bring their laws on intellectual property rights into line with those of other members. New legislation had to be drafted to extend property rights protection to plant varieties, and staff had to be trained. This protection, together with the costs of implementing sanitary and phytosanitary regulations for trade purposes, can be expensive for developing countries. What the long-term effects will be of tighter protection of intellectual property rights on agricultural production in developing countries is not clear. Ideally, such protection, by creating monopoly rents for the developer of the new product, should encourage firms in developed countries to undertake research on crops that are appropriate for developing countries. On the other hand, if intellectual property rights are operative, there is no incentive for private firms to disclose the results of any discoveries that cannot be patented, and so the pool of knowledge released into the public domain will be smaller. Under the current regime of the Agreement on Trade-related Aspects of Intellectual Property Rights, all members of the World Trade Organization are obliged to provide patents on all forms of technology — including biotechnology. There are a few exceptions and those relating to agriculture and biodiversity are contained in article 27.3 (b) of the Agreement, which states that plants and animals, but not micro-organisms, can be excluded from patentability in national laws. However, while plants do not have to be patented, "plant varieties" must be made subject to some form of intellectual property protection, "either by patents or by an effective sui generis system or by any combination thereof". (The role of the Agreement is further examined in sect. III below.) The 1961 International Convention for the Protection of New Varieties of Plants[3] which established the International Union for the Protection of New Varieties of Plants has some inherent advantages over patents. A related concern is the issue of "farmers' rights". Farmers' rights are protected under the 2001 International Treaty on Plant Genetic Resources for Food and Agriculture of the Food and Agriculture Organization of the United Nations (FAO). Farmers' rights are, however, not yet operational. The Treaty is vital in ensuring the continued availability of the plant genetic resources that countries will need in order to feed their people.

18. Policies that have an impact on farming and other agricultural processes cannot ignore their impact on ecosystems and their biodiversity. There is an increasing emphasis on research oriented towards preserving the ecosystems. The overexploitation of land for agricultural gain can have long-term negative effects on

[2] See *Legal Instruments Embodying the Results of the Uruguay Round of Multilateral Trade Negotiations, done at Marrakesh on 15 April 1994* (GATT secretariat publication, Sales No. GATT/1994-7); also available from www.wto.org/english/tratop_e/trips_e/t_agm0_e.htm.

[3] United Nations, *Treaty Series*, vol. 815, No. 11609.

the biodiversity of a region. Research on ecosystems will thus have important ramifications for agricultural policy. Such research should be encouraged and supported. In a related manner, there has been a growing emphasis on organic agriculture which is described by FAO as "a holistic production management system which promotes and enhances agro-ecosystem health, including biodiversity, biological cycles, and soil biological activity" (FAO/World Health Organization (WHO) Codex Alimentarius Commission, 1999). Such types of agricultural practices that focus on sustainable agriculture with the ecosystem in mind need to be nurtured.

C. Promoting private technological transfer and research

19. While a complex set of factors determine the volume and direction of foreign direct investment (FDI), there is a growing recognition of the important role that it plays in transferring technology to low- and middle-income countries. However, it is very unevenly distributed among developing countries, with low-income countries being a relatively marginal destination for such investments.

20. In order to derive long-term benefits from FDI, especially through technology transfer, countries need to have the necessary absorptive capacity. Countries need to invest in skill creation and infrastructure. They need to provide strategic policy direction and an efficient administration. On the other hand, when FDI is attracted in response to major tax incentives, or as a result of trade policy distortions, without a simultaneous build-up of local capabilities, and without the creation of linkages between foreign affiliates and local firms, there is limited scope for long-term benefits of FDI. Yet, increasing competition among countries for limited investment flows in the world market has led to more enhanced incentive packages meant to attract investors. These packages erode the benefits from such investment; hence, it is unclear what benefits accrue to the host country. At the same time, World Trade Organization rules prohibit mechanisms that were widely used in the past to increase the benefits for host countries (see below).

21. Technological innovation and adaptation require funding, but funding alone is not sufficient. Networks of private firms, research institutions and government also play a crucial role. Such horizontal networks are essential conduits for knowledge, capital, products and talent. Firms that can develop strong links to research institutions, financiers, partners, suppliers and customers have an advantage in respect of acquiring, modifying and then commercializing new technology.

22. Thus, the government should strive to engage the private sector and promote business activities in R&D. Fiscal incentives and, direct public sector credit and subsidies can lower the cost of technological innovation and adaptation, and reduce the uncertainty that surrounds innovative activities. Fiscal incentives may take the form of tax deductions and credits for particular types of innovative activities. Direct public credit may take the form of loans for innovative investment and the acquisition of technology by development banks, which may grant preferential interest rates and favourable repayment schedules. Subsidies may be allocated to entrepreneurs through competition according to their projects' potential to bring about technological upgrading, as well as spillovers in the form of learning or the creation of forward and backward linkages. In any case, any incentive system

should be regularly evaluated on the basis of its contribution towards building domestic technological capacities.

23. Business and technology incubators, which typically exercise an important function in supporting small and medium-sized enterprises, could be supported through public policies. Policies that facilitate the creation of venture capital, technology parks, and networks (involving national as well as international actors) that help small and medium-sized enterprises access highly skilled labour and pool business services, foster private partnerships for mentoring and marketing.

24. Articles III and XI of the General Agreement on Tariffs and Trade (GATT) prohibit measures that run counter to the principle of national treatment or imply quantitative restrictions. Measures that are explicitly prohibited include local content and trade-balancing requirements, and restrictions on foreign exchange flows related to enterprises. Other measures that are explicitly prohibited, conditioned or discouraged include those on joint-venture requirements, location of headquarters, technology transfers and restrictions on sales in the domestic market. These measures were used by many developing countries in the past to promote industrialization and exports. The World Trade Organization Agreement on Subsidies and Countervailing Measures[4] does, however, allow for technology subsidies. It is important to evaluate the current system in the context of the net benefits for developing countries in terms of technological development. Carefully tailored incentives for investment in capital goods, innovation, manufacturing capabilities and participation in skills upgrading certainly facilitate technology transfer, assimilation and trade.

D. Improving infrastructure for promoting technology and innovation

25. The creation and application of scientific innovation also require basic infrastructure. Such infrastructure includes a sound network of roads and transportation, reliable supplies of electricity and sound telecommunications networks and other public utilities. Infrastructure services are intermediate inputs into production processes, as they impact the productivity of other factors of production.

26. However, putting proper infrastructure in place itself requires innovative technology. Thus, infrastructure development can provide a foundation for technological learning, involving the use of a wide range of technologies, institutional arrangements and appropriate policies. The United Nations Millennium Project (2005) has pointed out that Governments rarely recognize that infrastructure and technological innovation for development reinforce each other. It has stressed that policymakers need to be aware of the dynamic role of infrastructure development and to take the initiative in acquiring the technical knowledge available through international and indigenous construction and engineering firms. For infrastructure to become more effective and extensive, developing countries

[4] See *Legal Instruments Embodying the Results of the Uruguay Round of Multilateral Trade Negotiations, done at Marrakesh on 15 April 1994* (GATT secretariat publication, Sales No. GATT/1994-7); also available from www.wto.org/english/tratop_e/scm_e/scm_e.htm.

need to adopt and enforce national standards that are consistent with international benchmarks. Standards should be such that they do not create barriers to innovation.

E. Making effective use of information and communication technologies (ICT)

27. It has been argued that the dissemination of information and communication technologies (ICT) has the potential to exert a sustained, long-lasting impact on productivity and economic growth, provided that policymakers implement strategies that facilitate a faster rate of ICT diffusion and more rational and holistic approaches to its uses. In providing benefits ranging from long-distance learning to improved financial and non-financial services to local farmers and microenterprises, ICT is thus becoming a necessity in developing countries. Recent findings in emerging economies suggest that those developing countries that managed to introduce ICT in local economies are the best performers in terms of their international competitiveness. For example, a technology that is significantly transforming economies and societies in developing countries is mobile telephony. Since 2003, developing countries have more cellular subscribers than do developed countries. In Africa alone, the number of mobile phone subscribers increased from 15 million in 2000 to over 80 million in 2004, an increase of 433 per cent. It is argued that mobile telephony, when used appropriately, has been the information and communication technology with the most significant impact on development. In developing countries, mobile phones are used for more than simple communication: often, they constitute a business tool by means of which producers and buyers can be fully informed before they make economic decisions.

28. Despite the massive potential of ICT to enable higher productivity and greater business participation, numerous obstacles remain in respect of their adoption by business, including low income levels, low literacy rates, lack of native language content and widespread lack of Internet awareness in business. In addition, insufficient telecommunications infrastructure and Internet connectivity; expensive hardware, software and Internet access; absence of adequate legal and regulatory frameworks; a lack of payment systems that can support online transactions; and a shortage of technically competent human capital all create resistance to online trading and discourage adoption of ICT, particularly within small and medium-sized enterprises. Governments need to ensure that national policies are in place for the transfer and appropriation of ICT as they pursue their country's goal of sustained economic growth and social development. Furthermore, for countries to be competitive in the global ICT market, it is important that they acquire a "critical mass" of experts in the technology sector. Building ICT capacity among women and girls would enhance the competitiveness capacity and contribute to a gender-equal society.

29. Noting the crucial role of ICT for development, the World Summit on the Information Society, during its first phase held in Geneva in December 2003, adopted its Declaration of Principle (see A/C.2/59/3, annex, chap. I, sect. A), expressing the resolution "to build a people-centred, inclusive and development-oriented Information Society, where everyone can create, access, utilize and share information and knowledge, enabling individuals, communities and peoples to achieve their full potential in promoting their sustainable development and improving their quality of life". In this regard, the Tunis Agenda for the Information

Society, adopted by its Summit during its second phase, held in Tunis in November 2005 (see the report contained in document A/60/687, chap. I, sect. B), encourages Governments to elaborate comprehensive, forward-looking and sustainable national e-strategies, including ICT strategies and sectoral e-strategies, as an integral part of national development plans and poverty reduction strategies (para. 85).

F. Technology foresight

30. Most industrialized countries set priorities in science and technology through foresight programmes. These involve stakeholders from industry, academia, research institutes, services, financial institutions and the government who participate for the purpose of determining the technological priority needs. A number of developing countries, including India, the Republic of Korea, Thailand and several Latin American countries, have conducted forecasting exercises. These exercises create strong awareness among all stakeholders of the country's technological needs, emerging global trends and the implications for national competitiveness and priorities. They are critical in the formulation of relevant policies that promote technological innovation, and strategies for funding and implementation, as well as planning and decision-making in different sectors of the economy. Technology foresight also allows countries to anticipate where the technological frontiers might be and develop policies through which to take advantage of emerging technologies such as ICT, biotechnology and nanotechnology.

G. Nurturing appropriate institutions

31. Scientists need the opportunity to apply their knowledge and to pursue rewarding careers in their chosen scientific fields. Horizontal networks could be one means of ensuring that scientific talent is not lost and that scientific learning and research are maintained. Thus, linkages between technology-based industry, academia and government need to be created, so that technologies appropriate to national needs are developed. In this manner, scientists and researchers can be employed in industry while maintaining their links to academia as well. Such linkages are not well developed in many developing countries, causing academics and researchers to pursue jobs elsewhere. Besides, owing to a lack of attractive opportunities at home, developing countries face the risk of departure of their highly skilled scientists and researchers.

32. Policies designed to retain such talent and stem brain drain should be developed. Some countries have indeed benefited from "brain circulation" where "circulating" highly skilled immigrants brought back valuable experience and know-how to their local economies. A widely cited example concerns the ICT sector in India. However, in most developing countries, losses from brain drain are much greater than the benefits from "brain circulation". In South Africa, for instance, the Department of Health estimates that over a quarter of the vacancies for nurses could not be filled in 2001, and the emigration of workers in this and other fields is even more common in other sub-Saharan countries. The absence of highly skilled individuals is likely to hinder innovation and the adoption of new technologies, reduce the quality of social services, and slow down, if not prevent, institution-building. However, highly skilled emigrants can contribute to the home economy from afar by being the source of knowledge transfer, as well as trade,

investment and remittances. Efforts at attracting expatriate scientists connected to industries and research institutions at home are increasingly common. For example, there is the programme of the International Organization for Migration on "Migration for Development in Africa", a recent initiative that seeks to mobilize competencies acquired by African scientists abroad for the benefit of Africa's development. It helps African Governments manage and transfer skills and financial resources acquired in the diasporas for use in national development programmes.

33. Academic faculties in many developing countries do not have the requisite resources or the incentives to keep up with the latest developments in their field. This situation can be changed by creating knowledge networks through encouragement of partnerships among universities at the national, regional and global levels. Most developing countries still distinguish between industrial policies that emphasize building manufacturing capabilities, including policies designed to generate new knowledge through support for R&D, and those dedicated to education. Combining these through integrated national innovation systems would help in focusing attention on the use of existing technologies while building a foundation for long-term R&D.

34. Overcoming the "domestic technology gap" should be a major objective of national innovations systems. This implies guaranteeing the access to technology of farmers and small urban producers. It requires developing the systems needed to generate and adapt technologies that are appropriate, and to disseminate them among small producers. The design of such systems should recognize that the reduction of existing technological dualisms is essential to reducing poverty and income inequality, but also that small producers can become a powerful production force when they have the adequate access to the factors of production complementary to the labour that they possess. In this regard, the promise of ICT and the potential of the technologies for small businesses and farmers need to be effectively tapped. The dissemination and use of ICT and other technologies for the poor would be greatly enhanced through better affordability and, in many cases, through community-based approaches.

35. Science and technology have relevance to most policy areas and concern most ministries and agencies of the government. Therefore, what is crucial is the establishment of appropriate intragovernmental coordination mechanisms with the participation of all stakeholders. In addition, policymakers require continuous advice with regard to emerging scientific and technological developments. It is therefore important that there be set up within the government a science and technology advisory body whose role would be to provide accurate, relevant and impartial advice on science and technology and help prevent confusion and duplication, as well as maintain coherence in government policy. This advisory body should also ensure that science and technology are integrated into the development plans of all branches of the government. The mandate of the advisory body should be legislated, and processes should be established to ensure that it is protected against undue political pressure from special interest groups.

36. Given the complexity of innovation and science and technology issues, advisory bodies have to be supported by national scientific academies and universities which can also benefit from a wide range of partnerships, including public-private alliances and partnerships with institutions with competence in science, such as independent research establishments and consumer groups.

Governments should establish close links with these institutions to ensure that science and technology decisions on related issues reflect the best interests of the public and national development goals.

III. Role of international strategies in fostering knowledge and innovation

37. The process of technological innovation has become intricately linked to the globalization of the world economic system. However, despite the globalization of technology, the involvement of developing countries in producing new technologies is almost negligible. Most new technologies are produced in developed countries. In this regard, the globalization of the activities of multinational corporations is still not reflected in the location of their R&D, which is still overwhelmingly concentrated in industrialized countries. However, there are a few newly industrialized economies that have made some inroads into technology-generation through their domestic research efforts. While there is a need for developing countries to improve their national innovation system, there is also a need for more to be done at the international level.

A. Promoting international research and development (R&D) networks through open access regimes

38. The Internet has made possible increased cooperation among scientists across the globe, facilitating speedy exchange of ideas and scientific information. The number of internationally co-authored articles in scientific journals doubled between 1990 and 2000. There has also been a rise in the numbers of open and collaborative projects designed to create "knowledge public goods". These projects, often referred to as open access regimes, include free and open source software (FOSS), the human genome project, the World Wide Web, the single nucleotide polymorphisms (SNPs) consortium and open academic and scientific journals. Locking in knowledge behind restrictive licensing regimes may not be the optimal choice if technological development is to be achieved in developing countries. As shown in particular by the experience of free and open source software, open access is more supportive of technological development in directions that are specifically relevant to the needs, demands and concerns of users, this being particularly important for developing countries. It also reinforces human capacity-building in science and technology and generally contributes to the generation of national capacity to achieve the internationally agreed development goals.

39. It is essential that legal regimes relating to patents do not affect the way scientific research and publishing are organized and conducted and maintain the practice of "open" science in the world's academic research communities. The promotion of knowledge public goods, whose expansion promises "additional user" benefits or positive network externalities, must be ensured. Examples in this regard include open access for scientific publishing, global communication and transport systems, and informal norms. Efforts to increase the inclusiveness of these goods will widen the range of users, globalizing the benefits and costs. It is therefore critical to examine in more detail the various building blocks of public goods, exploring especially the types of incentives that different actors — public, private,

national and international, including multilateral institutions — might require in order to be motivated and able to deliver their expected contributions to the development of a particular public good. The United Nations is already at the forefront of the drive to establish open access to information and technology. Its role in this area should be further strengthened.

40. Another source of scientific knowledge is publicly funded R&D. A new report on the scientific publishing industry by the Organization for Economic Cooperation and Development (2005) finds that Governments would boost innovation and secure a better return on their investment, in particular social returns, in publicly funded research if they made research findings more widely available. To that end, the report suggests that coordinated efforts at national and international levels are needed to broaden access to data from publicly funded research and contribute to the advancement of scientific research and innovation. There is a need to consider the establishment of an international database on publicly funded R&D that would assist developing countries in accessing technologies based on their needs.

B. Development dimensions of intellectual property rights

41. While intellectual property rights are important, there remain significant disagreements as to their development dimensions. The history of intellectual property rights protection shows that countries with low levels of technological capacity had generally had weak standards until they reached a level of development at which their industries could benefit from such protection. However, today, patent regimes play an increasingly important role in technology markets. Despite some initiatives undertaken regarding the issues facing developing countries in different sectors, important gaps remain with respect to understanding the changing role of patents in fostering knowledge creation and diffusion. New technologies, such as biotechnology, nanotechnology and ICT, are of particular relevance in this context.

42. About 95 per cent of all patents are held by developed countries. As a consequence, they can exert influence over key aspects of science and technology. The Agreement on Trade-related Aspects of Intellectual Property Rights severely restricts reverse engineering and other forms of imitative innovations that were used widely in the past by developing countries and that are used even now by industrialized countries. It also makes access of developing countries to proprietary knowledge more costly. The kinds of limitations introduced by the Agreement implies an asymmetry that favours the producers and holders of protected intellectual property — mainly in developed countries — at the expense of those trying to gain access to protected intellectual property — mainly in developing countries. Moreover, the Agreement requires developing countries to expand and enhance their intellectual property regimes, while containing very few provisions aimed at effectively facilitating and promoting their access to technology.

43. Even higher levels of patent protection are sought through regional and bilateral free trade agreements. The "TRIPS-plus" obligations included in these agreements often eliminate the limited options developing countries now have with respect to adapting their legislation to meet their needs by using the flexibilities allowed under the rules of the Agreement on Trade-related Aspects of Intellectual Property Rights. This amounts to a push for even higher standards and modifies the benchmarks established when the Agreement was being negotiated. At the time the

Agreement was negotiated, it was agreed that developing countries would not be required to confront even higher levels of protection for the various forms of intellectual property.

44. Currently, patents apply only in the country where they are granted, although there are proposals to move to a global patenting system. Besides the need to consider the benefits that global patents could yield in terms of reducing time and patent office fees, there exists an even greater need — that of focusing on the requirements of developing countries and treating intellectual property as one of many tools for development. Unlike developed countries, which tend to view the World Intellectual Property Organization (WIPO) and the World Trade Organization as bodies providing them with the opportunity to ensure higher intellectual property standards, developing countries tend to view both organizations, and the treaties they embody, as the tools of development policy.

45. There is growing consensus among the international development community on the need for WIPO to examine and address all features of existing intellectual property rights, including the economic and social costs that intellectual protection may impose on developing countries, and on consumers of knowledge and technology both in developed and in developing countries. A four-point proposal to establish a "development agenda" and reform WIPO has been put forward to WIPO members by 14 developing countries in the Group of Friends of Development (World Intellectual Property Organization, 2004). The development agenda process has been viewed by some countries as an opportunity for WIPO members to mainstream development concerns into WIPO activities and to ensure that international intellectual property systems take into account development goals.

46. One important aspect of intellectual property protection is the protection of traditional knowledge held by local communities and indigenous people in respect of conserving biological diversity. The fact that, currently, there is no effective protection system for such knowledge has led to cases of biopiracy. There need to be effective measures for the protection of such knowledge as well as for the equitable sharing of the benefits arising out of the use of such knowledge. The issue is being addressed in such bodies as the Convention on Biological Diversity secretariat, WIPO and the World Trade Organization.

C. Nurturing new alliances: South-South cooperation

47. There are numerous factors that impede technology transfers from developed to developing countries including:

(a) The continuing shift of research activities in developed countries from the public to the private sector. This limits the avenues for collaborative research between developed and developing countries, since the latter continue to rely on public funding for scientific research and private corporations are reluctant to share technology with them;

(b) The fact that technological advances made in developed countries have limited impact on or are not necessarily tailored to the needs of developing countries. Even if technologies are transferred or partnerships are developed, the needs of developing countries are not going to be met. This is especially true if the system is market-driven. While the demand for science and technology solutions

exists in poor countries, the market-based incentives necessary to actively respond to such demand are missing. The area of infectious diseases is a good example. Most global biomedical research has focused on the problems of developed countries. In fact, only 1 per cent of the medicines developed over the past 25 years address tuberculosis and tropical diseases, which, according to WHO, account for 11 per cent of the global disease burden.

48. These factors have led to the increasing attention directed towards cooperation among developing countries themselves for the purpose of finding scientific solutions to their developmental problems, that is to say, South-South cooperation. This process is also driven by the emergence of countries such as Brazil, China, India and South Africa as regional actors with increasing technological capabilities. Such cooperation has helped poor countries find appropriate, low-cost and sustainable solutions to their problems. For example, science ministers from Brazil, India and South Africa have been working together to identify areas for cooperation in preventing and treating HIV infections and AIDS. In efforts to address the tropical Chagas' disease, Costa Rica, in partnership with Brazil, Chile, Uruguay, Argentina and Mexico, brokered a deal with the United States National Aeronautics and Space Administration (NASA). The arrangement was to fly proteins derived from the parasite that causes Chagas' disease on the space shuttle to study their structure and there have been promising results. Regional cooperative efforts in scientific research are also gaining ground. The Arab Science and Technology Foundation, created in 2002, provides research support for regionally relevant issues such as water management and solar energy.

49. Another significant trend emerging in global R&D is the increasing cooperation among multinational corporations of the South: firms from Malaysia, the Republic of Korea, Singapore and Thailand recently initiated R&D activities in India. This trend highlights the expansion of South-South cooperation beyond Government-to-Government collaboration, and thus represents a potential for development driven by R&D.

50. Such alliances should be encouraged and nurtured. South-South cooperation on issues related to technology is an integral part of globalization. Such cooperation should be designed as a strategic approach to leveraging technical knowledge from wherever it is located in order that it may be applied wherever it is needed. The starting point could be regional cooperation, which could then be extended to other developing countries and eventually to the global economy.

IV. Role of the United Nations

51. The United Nations is already playing a significant role in disseminating useful scientific information to developing countries. The Commission on Science and Technology for Development has contributed to efforts to bridge the technology gap between developed and developing countries. However, the role of the Commission needs to be strengthened further. In this regard, the Economic and Social Council on 28 July 2006, adopted resolution 2006/46 entitled "Follow-up to the World Summit on the Information Society and review of the Commission on Science and Technology for Development". The Partnership on Measuring ICT for Development, established in 2004 by the United Nations system and its development partners (including the International Telecommunication Union,

OECD, United Nations Conference on Trade and Development (UNCTAD), the United Nations Educational, Scientific and Cultural Organization (UNESCO) Institute for Statistics, four regional commissions, namely the Economic Commission for Africa (ECA), the Economic Commission for Latin America and the Caribbean (ECLAC), the Economic and Social Commission for Asia and the Pacific (ESCAP) and the Economic and Social Commission for Western Asia (ESCWA), the information and communication technologies (ICT) Task Force and the World Bank), developed a common set of core ICT indicators for a coherent and structured approach to advancing the development of ICT globally.

52. UNESCO has been at the forefront in respect of promoting scientific learning in its member States. Following the recommendations of the World Conference on Science (Budapest, June-July 1999), UNESCO launched a joint initiative involving its Education and Science Sectors to promote education and capacity-building in science and technology in its member States. UNESCO aims to encourage and assist all its member States in developing effective science and technology education programmes in line with the Education for All goals in the formal and non-formal sectors.

53. In order to keep policy relevant to the evolving market needs and development of science, technology and innovation, UNCTAD undertakes science, technology and innovation policy reviews, which aim to help developing countries identify and adjust their policies and institutions in order to support the technological transformation, capacity-building and innovation of their enterprises. Policy reviews help countries meet the market needs of the science, technology and innovation systems as well as new and emerging science, technology and innovation sectors.

54. The outcomes of the two phases (Geneva and Tunis) of the World Summit on the Information Society represent the international consensus on how a major set of technologies, namely, ICT, are to be harnessed and put at the service of development. Many United Nations organizations and other entities have a role to play in the implementation of these Summit outcomes in their respective fields of expertise. They should also collaborate closely with the Economic and Social Council, through the Commission on Science and Technology for Development, in its system-wide oversight role, as provided for in the Tunis Agenda for the Information Society (para. 105). The United Nations system should also actively facilitate South-South cooperation to generate research relevant to industrial and technological development, and the exchange of knowledge and best practices.

55. At the operational level, the United Nations could play an equally critical role. The United Nations could provide a forum where developing countries would share success stories and lessons learned from their respective national efforts to apply science and technology for development. It could provide expertise and analytical studies on integrating science, technology and innovation policies into national development strategies and utilizing them as effective tools for achieving the Millennium Development Goals and other internationally agreed development goals. More importantly, the United Nations could facilitate the establishment of a network of centres of excellences in developing countries to support interaction among scientists and engineers and to maximize use of the research facilities in those countries for development purposes. This, in turn, would encourage countries to establish regional and subregional science and technology cooperation systems and carry out cooperative R&D programmes.

V. Conclusions and policy recommendations

56. The growing gulf in technological and scientific capabilities between developed and developing countries has been a continuing concern for decades. This technology gap impedes the capacity of many developing countries to participate fully in the global economy. Recently, a few emerging economies have made significant breakthroughs in their scientific and technological capacities with a strong demonstration effect on other developing countries. Forward-looking economic policies that successfully engaged the private sector, academia and industry led to beneficial networks that have made possible the use of scientific and technical knowledge in accomplishing their developmental goals. Some of the countries with large market potential have moved on to become regional players and have fostered South-South cooperation in advancing scientific knowledge and research. Much more needs to be done at both the national and international levels. Poorer countries first need to develop a sound scientific base in terms of human talent as well as infrastructure that can encourage the application of scientific solutions to their domestic developmental concerns. At the international level, global rules governing scientific knowledge need to be flexible so that scientific learning and application can be fostered. Multilateral institutions as well as regional development organizations have a critical role to play in this regard. This report has highlighted some key concerns of developing countries and their possible solutions. The following recommendations deserve attention.

57. At the national level:

- Initiation of scientific and technological education should start at the primary level and be consolidated through the secondary level. Policies supporting scientific education should be developed, bearing in mind the constantly evolving nature of technical and scientific learning. In this regard, ongoing training of teachers and improvement of the content and quality of education at all levels are critical

- It is essential that there be increasing enrolment in courses on technical subjects at the tertiary level, which would be achieved by making them more attractive and allocating more resources to them. A proper mix of supportive policies and institutions tailored to local and national needs will help in this regard

- Policies to retain scientific talent and stem the brain drain and encourage "brain circulation" need to be developed. Efforts to keep expatriate scientists connected, through scientific diasporas, to industries and research institutions at home should be promoted

- Linkages between technology-based industry, academia and government need to be created, so that technologies appropriate to national needs are developed. Knowledge networks must be created by encouraging partnerships among universities at the national, regional and global levels

- Governments need to engage the private sector and promote business activities in science through fiscal incentives, direct public credit and subsidies that lower the cost of innovative investment. Policies that

encourage business and technology incubators, and the creation of venture capital should be implemented

- Policy forums should be organized at the subnational level where the directors of public research institutes could exchange R&D strategies, discuss ways and means to promote the transfer of technology and identify joint projects
- Governments should recognize that infrastructure and technological innovation for development reinforce each other and should take the initiative in acquiring the technical knowledge available through international and indigenous construction and engineering firms
- Diffusion of ICT should be ensured through low-cost access and connectivity through investments in infrastructure, research and development. Resource mobilization for this purpose should be recognized as part of national development strategies
- National innovation systems in developing countries should give central attention to overcoming the "domestic technology gap". This means guaranteeing the access to technology of farmers and small urban producers, and thus developing adequate systems to generate and adapt technologies that are appropriate, and to disseminate them among small producers
- Government advisory bodies could be created to monitor the implementation of appropriate policies through which to promote science and technology

58. At the international level, efforts must be enhanced to:

- Create an international database on knowledge and research information resulting from publicly funded R&D projects so as to assist developing countries in accessing technologies and know-how for creating technology-based enterprises and upgrading existing industries
- Facilitate regional, subregional and interregional joint R&D projects by mobilizing existing scientific and R&D resources and, where feasible, constructing and supporting cyber-research laboratories by networking sophisticated scientific facilities and research equipment
- Establish a technology development consortium among companies by mobilizing and pooling R&D resources
- Create a network of major R&D institutions and industrial enterprises able to meet human resource training needs and other demands of the industrial sector on a cost-sharing basis, with linkage to institutions in advanced countries, so as to encourage better utilization of limited resources in the region
- Develop a network of knowledge-sharing among innovation actors (for example, industry, academia and research institutes) by area and subregion
- Ensure that the development dimensions are mainstreamed into global intellectual property rights regimes, guaranteeing an adequate diffusion of

scientific and technical knowledge and avoiding excessively high costs of proprietary technology. Such regimes should also be revised to eliminate adverse effects on vulnerable groups in society, in particular by ensuring affordable access to medicines by all, and the diffusion of technical knowledge among small farmers and urban producers

- Ensure farmers' rights and protect traditional knowledge for the conservation and sustainable use of plant genetic resources

- Ensure that South-South cooperation is designed so as to leverage technical knowledge from wherever it is located and apply wherever it is needed. The starting point could be regional cooperation which could then be extended to other developing countries and eventually to the global economy

- Assure that, in pursuance of the mandates given by the World Summit on the Information Society and the 2005 World Summit, the United Nations plays an increasingly active role in ensuring that developing countries are able to achieve their goals in the area of innovation, science and technology

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